ANNUAL REPORT

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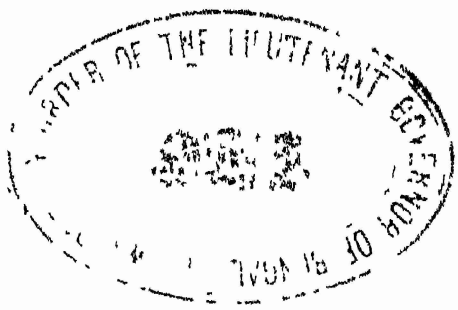

AGRICULTURAL DEPARTMENT, BENGAL

FOR THE YEAR 1886-87.

Calcutta;

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OFFICE OF THE DIRECTOR OF THE AGRICULTURAL DEPARTMENT, BENGAL.

No. 1264Agri.

FROM M. FINUCANE, ESQ., C.S.

Director of the Agricultural Department, Bengal,

TO THE SECRETARY TO THE GOVERNMENT OF BENGAL,
REVENUE DEPARTMENT.

(THROUGH THE BOARD OF REVENUE).

Dated Calcutta, the 16th August 1887.

SIR,

IN accordance with the orders of Government conveyed in paragraph 2 of the Resolution, dated 11th January 1887, on the first Annual Administration Report of the Agricultural Department in Bengal, I have the honour to submit, through the Board of Revenue, a report on the operations of the Department to the end of the official year 1886-87. The first report dealt with the period from the date of my delegation on special duty to the end of July 1886; but as the orders passed on that report directed that future administration reports should be for the official year, the present report will have special reference to the period from July 1886 to the end of March 1887, and, therefore, will be supplementary to that already submitted, so as to bring the narrative up to the end of the financial year, rather than an administration report for the whole official year.

CHAPTER I.—ORGANIZATION AND MAINTENANCE OF VILLAGE RECORDS.

The work done during the year in connection with the organization and maintenance of village records consisted in the supervision of surveys and the preparation of records of right, the principal of which will be found described below—

Cadastral Survey and Settlement operations in Mozufferpore.

2. The circumstances which led to the undertaking of a cadastral survey and record of rights in the Mozufferpore district under chapter X of the Tenancy Act as an experimental measure were described in my first annual report, and a *resumé* was given of the results of the operations so far as they had then gone. The survey operations were stopped, in accordance with the orders of Her Majesty's Secretary of State, in July 1886, and the progress of settlement work was also stopped in the November following, except only in 235 villages, the draft record of which had been published under the first part of section 103 of the Tenancy Act.

3. From the commencement of the operations to the 31st March 1886 the demarcation of 916 villages comprising an area of 566 square miles had been completed. The total area cadastrally surveyed up to that date was 219·93 square miles, and the records of 68 villages, comprising an area of 16 square miles, had been made over to the Settlement Department for attestation. The attestation and record of rents had proceeded in 24 out of these 68 villages.

4. No progress was made in demarcation after 1st April 1886, but the trijunctions of 892 villages comprising an area of 555 square miles, in Chukla Gurjaul, pergunnah Bisara, and in pergunnah Ratti, were marked out with stone pillars. During the year 47 boundary disputes were reported, making a total of 350, and 86 were disposed of, making a total of 230 since the beginning of the operations.

5. The cadastral survey operations continued up to July, and an area of 193·91 square miles was completed, in the year under report, making a total of 413·84 square miles cadastrally surveyed. The records of 552 villages in all, with an area of about 300 square miles, were made over to the Settlement Department before the survey office was closed in October last. In addition to the area cadastrally surveyed, the professional traverse survey of the boundaries of 1,356 villages, comprising an area of about 700 square miles, had been completed in advance of the cadastral work.

6. Out of the 552 villages of which the survey records had been made over to the Settlement Department the work of attestation of holdings and record of rents was completed, before closing operations, in 356 villages, with an area of about 155 square miles. Existing rents were recorded for 43,778 holdings, and of these, again fair rents were settled under section 104 of the Tenancy Act in 13,370 instances. The following are the details of classification of holdings of the 43,778 ryots whose rights and rents had been thus ascertained :—

Ryots at fixed rates	2,033
Settled ryots	36,250
Occupancy, but not settled ryots	340
Non-occupancy ryots	2,691
Under-ryots	2,430

Besides the 356 villages in which attestation of holdings had been completed, the local explanation of the entries in the khatians had been carried out in about 150 villages more.

7. The settlement operations were finally stopped in November, even in villages which had been surveyed, and of which existing rents had been recorded, except in regard to the villages of which the draft record had been published under the first part of section 103 of the Tenancy Act. The records of 235 villages had been thus published, and Mr. Collin has since been engaged in disposing of objections made under section 106 and in preparing the records for final publication. This work was well advanced at the close of the year, but the disposal of contested objections, involving in each the protracted procedure of a civil suit, has necessarily taken some time to complete.

Moreover, Mr. Collin, in addition to the supervision of this work, was also called upon to co-operate with the Settlement Officer of Goruckpore in the settlement of disputed boundaries between Bengal and the North-Western Provinces. The Assistant Settlement Officers were also transferred—Baboo Nundji at the end of November, and Baboo Barhandeo Narain at the close of December.

8. There were altogether 1,015 petitions of objection registered, of which 678 were contested, and had to be tried as civil suits. At the close of the year 143 objection cases, affecting the records of seven villages, where disputes were numerous, were pending, and the rest had been disposed of. Since the end of the year the settlement operations have been brought to a close, and Mr. Collin's final report, which will soon be submitted to the Board, has been received.

9. From the statistics of the 235 villages of which the final record has been published, it appears that 78 per cent. of the whole area is cultivated, and 22 uncultivated, but from among the latter, 3 per cent. is rent-paying land under thatching grass, 5·3 per cent. is under orchards, and 7 per cent. is unfit for cultivation, so that only 6·4 per cent. of the entire area of these villages is left for pasture land, which, though of inferior quality, may possibly be brought under cultivation if no land were left for grazing. When it is remembered that the agricultural population of this tract (which does not include the town of Mozufferpore) is 824 souls to the square mile, and that this population increased 15 per cent. within the last decade, it will be seen how little room there is left for extension of cultivation, and how great is the pressure of the existing population on the resources of the soil. The rent-paying area is 79 per cent. of the whole, and the land held by proprietors as nij-jote or cultivated by them but other than nij-jote, is 16 per cent. The lands recorded in the proprietor's possession, but not nij-jote or *sir*, exceeds that recorded as really *nij-jote*, *sir* or *zeraat*, in the proportion of about 5 to 3.

10. As regards classification of holdings in the 235 villages of which records have been finally published, it appears that there are in these villages 26,066 holdings, which are divided as follows :—

		Per cent.	
Ryots at fixed rents—			
Resident ...	1,551	5·95	7·39
Non-resident ...	376	1·44	
Settled ryots—			
Resident	17,052	65·41	85·30
Non-resident	5,187	19 89	
Occupancy but not settled ryots—			
Resident	75	·28	·63
Non-resident	93	·35	
Non-occupancy ryots—			
Resident ...	995	3 81	6·63
Non-resident	737	2·82	

11. It was always known that a very large proportion of ryots in Behar were, as a fact, possessed of occupancy rights, but without the facilities afforded by the presumption in favour of those rights by the Tenancy Act, it would not have been possible for the ryots to prove their existence. The average area of a holding is small, being approximately 1½ acres; but this area does not represent the average quantity of land held by each individual, for some ryots cultivate in more than one estate, or in more than one village. Thus while the total number of holdings is 26,066, the total number of ryots is 19,495. Making allowance for these facts, the average holding of a settled ryot appears to be, as nearly as possible, 3 acres. The area of holdings of settled ryots is larger than that of non-occupancy ryots, which on an average is about 1½ acres.

12. The average rental per acre is found to be a fraction over Rs. 3. This is probably a higher all-round-rate than prevails in one other province in India, and it must be remembered that this average is arrived at by spreading the total rental over the entire rent-paying area, which, as all culturable land has been brought under cultivation, includes land of the most inferior descriptions, while the average of other provinces is struck on only the comparatively small percentage of the entire area brought under cultivation, in which land of the most inferior qualities is not included. Moreover the villages in which the draft record had been published before receipt of orders stopping the proceedings, and in which alone the operations have been carried on to completion, were those in which the relations of landlord and tenant were most harmonious and where rents had not been screwed up, as much as elsewhere in recent years. Though these rents, may not appear to be high in themselves, gauged by the standard of other countries, yet they were, Mr. Collin reports, evidently much lower in recent years, and they have, he adds, been enhanced, not by any legal process, nor on any legal principle, but in many instances by the arbitrary exercise of proprietory power, by unscrupulous resort to the Civil Courts, and by abuse of the rights of contract.

13. In only about 33 per cent. of the holdings were fair rents settled on the application of the parties under section 104 of the Act. This settlement was generally effected on the verbal application of the ryots, and took the form of an uncontested suit, the landlords admitting the existing rent to be fair. In no case was formal application made for an enhancement or reduction of rent. The reason for this forbearance on the part of the landlords was, Mr. Collin thinks, their apprehension lest by attempting to have rents enhanced they should drive the ryots to under-state their existing rentals, the amounts of which the landlords were doubtful of their ability to prove.

14. The survey and settlement has, Mr. Collin reports, been carried on without any friction or serious difficulty. Some of the proprietors and landlords, especially the managers of indigo factories, gave him great assistance, and bore with patience and good-will all the trouble which the inauguration of a new work of survey and settlement must cause. The

absence of friction was shown by the facts that in only two or three petty cases did the operations lead to a breach of the peace; only one application objecting to the proceedings (and that an anonymous one) was made to the Board of Revenue in its executive capacity; no appeals in regard to boundary disputes went beyond the Settlement Officer to the Commissioner; of 498 cases decided as contested civil suits up to the 31st March, in only 42 were appeals made to the special Judge, and in these the judgment of the Settlement Officer was upheld in 11 and reversed in only 3 cases.

15. As regards the attitude of the parties, Mr. Collin says that the ryots eagerly attended at the attestation of the records, and took great interest in having their fields and rents correctly recorded. They also came freely into the Settlement Office to receive copies of their khatians (abstracts of holdings), and objected when the entries in these khatians were not correct They appreciated the value of the abstracts of holdings which were given to them, and the Settlement Officer does not believe that they will allow more rent to be illegally exacted from them hereafter than is therein recorded. The effect of these records in enhancing the value of ryots' property is, he adds, already visible in the sales of holdings which are taking place in settled villages. The ryots were, in Mr. Collin's opinion, disappointed at the closing of the settlement in villages where operations had commenced, and in a few cases they petitioned for its continuance and offered to pay the cost. When the general lethargic character of Behar ryots is considered, this, he adds, shows greater earnestness on their part than would at first appear probable, especially when the effect of taking of such a step without the consent of the proprietor is remembered. I also think that the ryots, notwithstanding some attempts made to deceive them, appreciated and liked the proceedings. The landlords were led by persistent misrepresentation to suppose, that as the proceedings were initiated by Government, they must necessarily be intended to injure them, but though frequently invited to show anything in the proceedings that was in fact unfair or unjust they have been unable to do so in any single instance. It would, however, be unreasonable to assert that Behar zemindars can have had any real liking for proceedings which must have the effect of putting restrictions on the arbitrary powers of enhancement of rent at present exercised by them, or that indigo-planters can have any real desire for the continuance of operations which would render it difficult and dangerous for them to take arbitrary possession of ryot's land.

16. The total expenditure of the Settlement Department from beginning to the end of the durations has been Rs. 63,668, and the total expenditure of the Survey Department to end of October, when the Survey Officers left the district, was Rs. 1,29,116, or for both survey and settlement, Rs. 1,92,784. The expenses incurred are no test of what the cost of these operations would be if they were regularly conducted on a large scale. The above sum includes the cost of demarcating trijunctions with pillars over an area of about 700 miles in addition to what was actually surveyed, and the price of about 1,200 pillars which are now lying at Hajipur. If the cost of the 700 miles of which traverse survey had been completed in advance, and the price of these pillars is deducted, the cost of the operations on the area cadastrally surveyed will be materially diminished. It is to be remembered that settlement operations did not begin till the hot weather, and that then the records of a connected area were not given, so that much time was wasted in moving from place to place. Again, the uncertainty which existed as to whether operations might not be brought suddenly to a close rendered economy difficult, and, moreover, the expenses incurred include a large initial outlay for tents, office furniture, transport of camp equipage and travelling allowances of officers joining their appointment, all of which, if the operations had continued, would have been chargeable to a larger area. The cost of the cadastral survey, inclusive of traverse work, is reported by the Survey Department to have been Rs. 255 per square mile, or a little under 6½ annas per acre.

17. I expressed at some length, in my first annual report, my opinion regarding the necessity for a survey and record of rights in Behar, the inefficacy of the Tenancy Act without a survey and record of rights, the results of the operations, and the probable effect of stopping them, and do not think it necessary to discuss these subjects again in this place, further

than to say that the facts since elicited in the course of the settlement operations, which will be found detailed in Mr. Collin's final report, soon to be submitted, do not afford any ground for altering the opinions expressed, in paragraph 22 to 25 of that report but on the contrary confirm and support them.

Cadastral Survey and Settlement Operations in Government Estate of Angul.

18. The Government estate of Angul lies within the geographical limits of the Tributary Mehals of Orissa, and was at one time a native State. The Chief of the State rebelled and was dethroned, and the State was confiscated in 1847. Since then it has been managed as a Government estate. It contains an area of 881 square miles, of which about 476 are supposed to be under cultivation.

19. The current settlement will expire in September 1887, and as a regular survey of the estate has never been made, it was deemed desirable to have a professional survey now made in connection with the resettlement of the Government revenue. The outer boundary runs along the borders of Tributary States, and being in many parts disputed, the demarcation of it is a work of some difficulty. A detachment of a professional party completed up to the end of the year 1886-87 the traverse boundary survey of 340 square miles. It was at first contemplated to have the cadastral work carried on under the supervision of the Professional Department, through the agency of up country and Bengalee amins; but having visited the estate in March, I recommended that an establishment of Bengalee amins, who had been employed by the then Settlement Officer in excess of the requirements of the case, should be discharged, and that the indigenous agency of surbarakars should be utilized for the purpose of carrying on the field survey. The Board and Government accepted the proposal, and surbarakars are now accordingly being trained in survey work. The local tehsildar, who is really a sub-divisional officer in every thing but the name, and Mr. A. K. Raye, a Cirencester graduate, who had been deputed to learn surveying in the Central Provinces, have been appointed Joint Settlement Officers, and they report that the surbarakars have shown great readiness to co-operate in carrying out the survey in the manner proposed. More than 250 of them have either come forward themselves or have deputed nominees on their behalf, who are being taught to survey, and will afterwards maintain the records, while more than one hundred surbarakars or their nominees are reported to have already learnt something of surveying. It is however, reported by the Settlement Officers that the native subordinates of the Professional Department, fearing that the employment of indigenous agency means the supplanting of themselves, are placing obstacles in the surbarakar's way, and it has been, therefore, arranged with Colonel Sconce that the survey officers are to be absolutely prohibited from employing on the field-to-field measurements any up-country or Bengalee amins or measurers, other than the surbarakars and their nominees trained at Angul; and further that if, by means of this indigenous agency, so trained, it should not be found possible for the Professional Department to complete the cadastral survey next cold-weather at a very moderate cost, the entire supervision of survey of the area then remaining will be undertaken by the Settlement Officers. The cadastral survey of 61½ square miles has been completed this season, but the records had not been made over to the Settlement Officers at the end of the year. The sum of Rs. 1,95,294 had been sanctioned for this work, but under the arrangements now made it is hoped that half of this amount will suffice.

Settlement of the Nulchira chur in the Noakhally district.

20. The supervision of the settlement of the Nulchira chur was made over to me at the end of the year. This chur became the property of Government in 1835 under the operation of Regulation XI of 1825. It was subsequently divided into two mehals, one of which was settled with the predecessors in title of one Fazl Rahman Chowdry and others, and the other with the predecessors in title of the Jackson minors, who respectively are the present settlement-holders. The settlement in each case was identical

in all material respects. It was a "temporary talooqdari settlement" for the period of 30 years, with a right to a re-settlement on suitable terms at the expiry of that period. The settlement expired in 1869, and proposals for a re-settlement were laid before the Government. The outcome of these proposals was an order to settle with those among the *abadkars*, who, by residence, position, and influence, were fitted to be admitted to settlement. The order also provided that the settlement-holders' tenure should not be unconditionally heritable and transferable; that every devolution required previous sanction; that the settlement-holders' right should wholly lapse if they or their successors refused to agree to the terms offered at any subsequent re-settlement; and finally that only those successors who were deemed qualified to discharge the duties appertaining to the position should be admitted to settlement on future occasions. The order in regard to the disqualification of heirs was subsequently modified by instructions from the Government of India recognizing the right of the Jackson minors, who came within the disqualifying conditions, to claim a settlement. The orders of the Bengal Government laying down the principles on which the settlement should be made do not seem to have been carried immediately into execution, while the effects of a storm-wave which devastated the *chur* in 1876 rendered a re-measurement necessary and caused further delay. When the settlement was taken in hand, the proceedings were conducted in accordance with the provisions of Act VIII (B.C.) of 1879, the present settlement-holders being regarded as tenure-holders, and the rights of the subordinate ryots being recorded under the provisions of section 7 of the Act. The proceedings did not give satisfaction to the settlement-holders, who, having failed to obtain a modification of them from the Board of Revenue, appealed to Government.

21. The settlement-holders claimed to have their titles declared, without any reservation, to be permanent, heritable, and transferable. They asserted their right to settlement without any record being framed of the rights of tenants who hold under them, and they claimed immunity from any higher assessment than Rs. 3 per *kani*. The last claim, namely, immunity from any higher assessment of revenue than Rs. 3 per *kani*, was rejected as inadmissible, as no such claim can be maintained on the terms of the *dowl* or lease granted in 1839.

In like manner the claim to freedom from the operation of the law regarding the procedure of assessing revenue [Act III (B.C.) of 1879] was disallowed.

22. As the representatives of the original clearers of the soil, the settlement-holders and their successors were declared to be entitled to a heritable and transferable right in their taluks, each taluk being regarded as an indivisible whole. This right Government ordered also to be regarded as permanent, so long as the settlement-holders or their successors agree to the assessment of revenue imposed at a re-settlement of the taluk. Refusal to agree to such assessment, or failure to fulfil the obligations thereby imposed, would, it was declared, involve the forfeiture of all the rights in the taluk which the settlement holders or their successors may possess; and it would thereupon be competent to the Government to make in regard to the taluks whatever disposition it pleases.

23. The proceedings connected with resettlement of the Dearah, though begun some years back were not owing to the causes above described, completed before the passing of the Tenancy Act. It was then deemed expedient to apply to the resettlement of this chur the provisions of Chapter X of that Act. The measurements already made were tested and found to be correct, and the areas of holdings, as ascertained by the previous survey, were accordingly accepted without remeasurement, subject to any objections which may be made to them when the draft record is published under Rule 33, Chapter VI of the Tenancy Act rules, which objections will have to be heard and decided as civil suits under Rule 32. Holdings have been classified in accordance with the provisions of the Tenancy Act and existing rents have been ascertained. Fair rents are now being settled by the Settlement Officer, Munshi Nundji, and it is hoped this long-pending settlement, together with the preparation of a record of the tenants' rights on the chur, will be concluded at an early date. The total area of the chur is 13,425 acres.

SURVEY AND RECORD OF RIGHTS OF WARDS' ESTATES.

Sunkerpore Ward's Estate in Dinagepore.

24. The survey and preparation of a record of rights in this estate was undertaken on the recommendation of the Collector of Dinagepore and Commissioner of Rajshahye, on the ground that there were no proper records of areas and of the rents of holdings, and also because it was supposed that the operations would lead to some increase in the ward's rent-roll. The work of survey has been carried on by a detachment of a professional party, while the record of rights and settlement of rents have been entrusted to Baboo Shushi Bhusan Dutt, a Sub-Deputy Collector. The total area of the estate is 270 squar emiles, of which 199 had been surveyed during the year, and an area of 71 square miles remains to be done. The cost of cadastral survey has been 6 annas per acre, which, though, as will presently be shown, lower than that of work done last cold-weather by non-professional agency in the same district, in the Churamon estate, is still higher than would appear to me to be desirable or necessary. The subject of effecting reduction in the cost has been discussed with the Deputy Surveyor-General, and if such reduction cannot be made, it will be a question for consideration next season, whether the work of the professional department should not be confined to traverse survey, the supervision of the field-to-field survey being entrusted entirely to the settlement officers, as is done in the Central Provinces. The different estates appertaining to this property are scattered throughout parts of the Dinagepore, Maldah, and Rajshahye districts, and this circumstance has added to the cost of the work.

The expenditure on the preparation of the record of rights and settlement of fair rents amounted to only Rs. 1,905 to end of June; but this work is only being now begun.

Churamon Ward's Estates.

25. These estates contain an area of 166,009 acres, or about 259 square miles. A non-professional survey of them by chain and compass was begun so far back as August 1881. An area of 1,22,715 acres had been surveyed in this manner up to March last, when it was decided that the survey of 39,244 acres, which remained to be done, should be carried on under the provisions of chapter X of the Tenancy Act, and the control of the settlement officer's work as regards this latter area was transferred to me. The area surveyed during the year under report is 20,173 acres, and the expenditure has been Rs. 9,366 or over 7 annas per acre. It thus appears that the cost of the non-professional and inferior chain and compass survey has been more than that done by the professional department in the same district and under similar conditions.

26. No settlement work has been done in these estates during the past three years. The old rent-rolls have not been revised, nor have new rent-rolls been framed, neither has a proper record of rights been prepared. The accumulation of settlement work now to be done is therefore very great. It was intended that the Manager of the estate should revise the rent-rolls and make amicable arrangements with the ryots on receipt of the measurement papers from the Sub-Deputy Collector, and it is hoped that he will now be able to undertake this important work without further delay. But in any case the undivided attention of one officer must be devoted to the survey and settlement operations in the area which remains to be done under the Tenancy Act.

CHAPTER II.—ANALYSIS OF DISTRICTS.

27. Enquiries were made in the months of November and December by Mr. A. C. Sen in Dacca and Mymensingh, and by Mr. Sakhawat Hossein in Dinagepore, with a view to the preparation of reports on the agricultural practices of these districts, similar to that submitted for Burdwan in the previous year. These enquiries are not yet completed, but the general conclusions come to by Mr. A. C. Sen, as the result of his enquiries, from a comparison of the agricultural systems prevailing in these districts and Burdwan may here be mentioned. They are that—

(1). The soil in most parts of the Dacca and Mymensingh districts is very good—in some places almost unrivalled in fertility, and the facilities for

profitable cultivation are very great, but the cultivators, as a rule, are lazy and devoid of any spirit of enterprise.

(2). There is a large tract of land including the Madhupur jungle and its outskirts, and bounded by the rivers Bansi, Buriganga, Brahmaputra, Lukhya, and the Jenai shown by red lines in the map annexed, the agricultural resources of which are very great, but which require capital and enterprize for their proper development.

(*a*). This tract is very well suited to sugarcane, and it is the best land which Mr. Sen has seen, excepting perhaps that in the neighbourhood of Tipperah, for the cultivation of that excellent variety of cane known as the Bombay, which, for the size to which it grows and the abundance and richness of its juice, has no rival in any part of India. If properly utilised, this tract can, he thinks, produce sugar sufficient to supply the demands of the whole of Bengal, but very little sugar-cane is grown on it at present.

(*b*). Cotton was formerly grown extensively in this tract, the soil as well as the physical aspect of the place being very well suited to the cultivation of it. The cotton raised here, though rather short in staple, was the finest known in any part of the world, and formed the material out of which very delicate and extremely beautiful Dacca muslin was manufactured. Since the decline of that celebrated fabric, the cultivation of cotton has almost entirely ceased in this tract. Considering the high price that cotton fetches in most parts of Bengal, and the improvement that has been effected in the yield of it by the introduction of some of the best American varieties, the cultivation of this important crop may be revived in this locality with great advantage.

(*c*). This area abounds in land that will grow first class tobacco.

(*d*). This tract is also suited for the cultivation of rhea and mulberry, both plants being found wild there.

(*e*). Both Dacca and Mymensingh abound in land that will grow potatoes of very superior quality, but at present the cultivation of potatoes may be said to be almost unknown in these districts.

(*f*). Ground nuts may be cultivated with great profit on the high sandy banks of the Lukhya, Brahmaputra, and Meghna rivers where the cultivation would cost very little, and the profit would be much greater than is at present obtained from jute.

28. Mr. Sen has arranged to have experiments tried by zemindars and ryots in Dacca and Mymensingh on the use of bone-meal, castor-oil cake, and saltpetre as manures, and in the growth of ground-nuts; and I shall myself also take an early opportunity to visit these districts, and, in consultation with the local officers and zemindars who are interested, endeavour to ascertain whether the improvements suggested may not be introduced by the latter.

As regards the existing agricultural practices, Mr. Sen remarks that the ryots of East Bengal take very little care to manure their fields They seldom apply oil-cake, hide salt or any other bought manure, and do not often make the best use of the cattle-dung which they have available without purchase.

It may be here remarked that because of the large extent of land now put under jute in these districts, the necessity of adding purchased manures to the land, in order to maintain its fertility intact, is increasing every year. The land on which jute is grown was formerly either set apart for grazing purposes, or was sown with *aus* paddy. In either case the cultivation of jute has reduced the quantity of cattle food and therefore of manure. Anybody travelling through the interior of the Mymensingh district will be surprised to find that in a place like this, where the land is most fertile, fodder is very scarce and the cattle wretched.

The Behea Sugar-cane Mill, which has produced almost a revolution in the sugar-growing districts of Behar and on this side of river Padma, is unknown in Dacca and Mymensingh. The art of *gur*-making is also little known or practised, so that though the extent of land capable of growing sugarcane in these districts is probably greater than in any other part of Bengal or Behar, yet the supply of sugar for local consumption comes from such distant places as Ghazipore and Benares.

In the *charas* of Meghna and Dhaleswari, Mr. Sen met with a fodder grass known locally as *lataghas* or *khyla*, which probably belongs to the same species as sugarcane. This fodder is extensively cultivated in some places, especially in the western part of the Moonshiganj sub-division. During the last rains, when the greater part of Dacca suffered from high floods, and when other fodder was most scarce throughout the district, this grass saved the lives of thousands of cattle, and owners came to buy it from a distance in some cases exceeding 50 miles. *Lata* is supposed to be a very nutritious food, and is much appreciated by cattle. As food for milk cows, it is believed by raiyats to increase the quantity of milk and to improve its quality. The cultivation of this grass is very simple. A number of plants are taken off a field and cut into small pieces. These cuttings are then planted in the soft mud left near river-sides on the receding of the inundation water. No further care need be taken of it till the time comes for cutting. The outturn of a bigha is in ordinary years said to be worth about Rs. 20. Once planted it will give one cutting annually for three successive years, after which the field should either be broken up and sown with some other crop, or replanted. The plant seeds freely, but the first full crop is not obtained earlier than the end of the third year.

The cultivation of this grass would appear to be capable of much extension, and an attempt will be made to grow it on the banks of the Ganges near the experimental farm which has been opened at Sibpore.

A careful analysis of districts will now be undertaken in accordance with the orders of the Government of India conveyed in their letter No. 219R—65-3, dated 11th May last.

III.—Collection of Rent and Revenue in precarious tracts.

29. According to the orders of the Government of India, the consideration of this question is to be confined to districts which have been the subject of particular analysis. As regards the districts of Dacca and Mymensingh, in which partial enquiries only have been made, no remarks are at present called for on the subject of the collection of rent and revenue, the latter it is believed being nowhere precarious in these districts.

Chapter IV.—Measures of Protection, including Arboriculture and Fodder Reserves.

30. It was reported in the first annual report that a proposal to turn the Government estates, on the Rhotas plateau, in the Khymore Hills, into a fodder and fuel reserve, had been submitted to the Board of Revenue. This proposal is still under the consideration of Government, and it is hoped that a Forest Officer will be deputed to Rhotas next cold-weather to enquire and determine, in communication with the Sub-divisional Officer, what trees should be preserved and what rules should be made for formation of a fodder and fuel reserve.

Planting of trees by roadside and in Government, Wards' and other Estates.

31. A circular letter has been addressed to local officers calling attention to the orders of Government on the subject of planting trees by road-sides, giving a list of trees which Dr. King, the Superintendent of the Botanical Gardens, is willing to supply gratis to public bodies or private individuals, and suggesting that in connection with questions of arboriculture, more advantage might be taken of the aid and advice of Dr. King, than has hitherto been the case. In response to this circular, applications for trees of different kinds have been received from many District Officers and Municipalities. A further circular, containing detailed instructions for planting trees by road-sides and elsewhere, is now being prepared in communication with the Superintendent of the Botanical Gardens, and with Mr. Worsley, who, as Collector of Mozufferpore, gave much attention to this subject, and this circular will, it is hoped, be of some assistance to local officers.

Reclamation of usar lands by planting trees.

32. Having noticed in the *Indian Agriculturist* that Mr. Maries, Superintendentof Gardens of the Maharajah of Durbhunga, had succeeded in reclaiming lands impregnated with saline matter by planting certain trees upon them, a letter was addressed to him, asking for further information on the subject. In reply, Mr. Maries wrote as follows :—

"When I came to Durbhunga six years ago, I was much troubled to know what to do "with certain patches of saline soils of the worst description. One was the site of an old saltpetre factory where even weeds would not grow. I had this soil dug deep (2 feet) and planted "thick (3′ × 3′) with *Inga Saman* (rain trees), *Albizzia Procera, Albizzia Lubbuk, Cassia florid millingtonia hortenus, sissoo, neem, &c.* The best were the two first named. They were "sown in pans, transplanted when the second leaves developed into single pots, and grown on "till about 3 feet high in pots. The salt ground was prepared as above, and the trees planted "early in the rains. The ground in three years was completely filled with roots, and to all "appearance the salt gone. The trees were thinned out last year only leaving the best, and the "ground is very good now.

"In another place near my house, where the ground was covered with white salts "quite one inch thick, and where nothing would grow, I had holes dug 4′ × 4′, and new "earth filled in, and large trees 12 months old transplanted with good poles, I gave the measurements of two on the worst ground to prove how they have grown—Albizzia 5 years old, height "40′, girth of trunk 4′ from ground 3′ 10″. A rain tree same age, girth 1′10″, height 20′, a "spreading tree. The ground now is covered with *doob* grass, and I have some splendid "plantains growing there.

"The trees I think should be thoroughly established in pots before planting, and this should "be done in favourable weather just at the commencement of the rains.

"The Inga Saman produces such an enormous quantity of surface feeding roots, and these "yearly decay, leaving a rich deposit of vegetable matter in the ground, and making the soil "open, and I have no doubt the trees take up the salts too, that in a few years the nature of "the soil is completely changed. The trees should be planted as thickly as possible.

"The timber is first rate for firewood, and the trees bear lopping well. I should think it "would be an excellent tree for swampy feverish places in Bengal or elsewhere, being such an "enormous water-absorber; it is as valuable as the willow or eucalyptus, the willow being used "by the Chinese as a preventative for fever, and always planted round villages in rice "districts.

"Albizzia is said to be a valuable timber; it is certainly a very handsome tree. I can give "you a supply of seeds, if you care to have them, for distribution and trial in other places.

"Ram tree seeds can be obtained from Dr. King, Seebpore Botanical Gardens."

Though the question of reclamation of lands impregnated with saline matter is not of such importance in these as in other Provinces, yet it is by no means an unimportant one in Behar, where considerable areas of saline soil are to be found. Dr. King, who was consulted on the subject, sees no reason to doubt the correctness of Mr. Maries' conclusions, and trees have been supplied by him for experimental cultivation on saline soil to District Officers who have applied for them.

A sample of the original soil reclaimed by Mr. Maries is at the same time being analysed with a view to determine how far it really contained saline matter.

Experiments in the cultivation of the date-palm.

33. The distribution of Dr. Bonavia's book, "The Date-palm in India," drew attention to the subject of the cultivation of the date-palm, and attempts were made to introduce this tree into the districts of Patna, Burdwan, Orissa, and Bhagulpore. The results may be said to be everywhere unsatisfactory. In some districts the seedlings failed altogether, and in none have they done well. The climate of Bengal appears to be too damp for this plant.

Eradication of disease among silk-worms.

34. The most important of what may be called protective measures taken during the period under report were those instituted in connection with the eradication of disease among silk-worms.

In the course of enquiries instituted at the instance of the Government of India on the suggestion of Mr. Wardle with a view to ascertain the cause of the decline of the Bengal silk industry, it transpired that, though the high and differential rates of rents charged on mulberry lands in some of

the mulberry-growing districts may have had a prejudicial effect on the silk industry, yet the effect was not so serious, as Mr. Wardle had been led to suppose, and that the main cause of this decline is the spread among the worms of diseases. Of these the most dangerous is known to the rearers as *kata*, pronounced by Mr. Wood-Mason to be the same as *pebrine*, which had in recent times broken out in an epidemic form in the south of Europe and caused great destruction of silk-worms. Other diseases also prevail, but they have always been known to the cocoon-rearers, and are of comparatively little importance, while *kata*, which has only been noticed within the past twelve years, is yearly becoming more and more destructive, and is at present causing most serious alarm. Mr. Wood-Mason, Superintendent of the Indian Museum, and Baboo Nitya Gopal Mookerjee, one of the most distinguished of the Cirencester graduates, were deputed to enquire into the nature of the disease, and the results of their investigations and of a local enquiry made by myself were laid before a Conference held in March last, under the presidency of Sir Edward Buck, which was largely attended by the mercantile community. After the subject had been very carefully gone into, it was settled that certain remedial measures suggested by Mr. Wood-Mason, and by Mr. N. G. Mookerjee, should be adopted. These measures are (*a*) the introduction of M. Pasteur's system by which moths intended for seed are microscopically examined, and the eggs of such as are found diseased are rejected; (*b*) the introduction of healthy conditions, that is to say, fresh air, cleanliness, plenty of space, and exercise in the rearing of cocoons, all of which conditions are ignored in the system at present followed by the rearers. It was also decided to get out a French or Italian expert in silkworm diseases, and to associate him with Mr. Mookerjee in the microscopic examination and selection of healthy seed.

The expert has not yet arrived, but Mr. N. G. Mookerjee has himself been working since that time, according to the plan then drawn up and already partially acted upon. He has since submitted three reports on three successive experimental crops.

His first report, describing the first series of experiments made by him, was circulated among gentlemen interested in the Indian silk industry for any remarks or suggestions they might wish to offer. Replies have been received from many of them, and are generally to the effect that the results of the experiment, so far as they go, are satisfactory, and that a good beginning has been made in the attempt to grapple with disease among silkworms.

The native rearers have shown a preference for the seed reared and microscopically examined by Mr. Mookerjee to that reared in the ordinary way, and went so far as to incur the expense of buying, according to his advice, untainted mulberry leaf at a high price, rejecting leaf in their possession which is believed to be tainted, by use on the land, on which it was grown, of manure containing excreta of diseased silk-worms. Mr. Mookerjee now thinks that he has eradicated disease from his experimental Madrasi stock and he is probably right; but it remains to be decided by the expert from Europe, who is soon expected, whether he has really done so. If it should prove that he has, then the question of the extension of methods adopted by him will have to be carefully considered. Enquiries are also being made on the subject of the natural history and ravages of the silk-worm fly, of which little is at present known.

Chapter V.—Agricultural Experiments, including Farms.

Burdwan Raj Experimental Station.

35. During the rains of 1886-87 considerable damage was done to this farm in a variety of ways. It was stated in the last year's report that the site allotted by the Raj managing authorities for the farm is not the best that could be desired, but the proximity to the Eden Canal was regarded as a great advantage. The experience of the last rainy season has proved that the proximity to the canal is not an unmixed good. In the month of September the portion of the canal which is near the experimental farm was kept at a high level to deliver water to the ryots at a time when it was raining almost incessantly, and when therefore there was little need for artificial irrigation. The site of the experimental farm being low, and the embankments of the canal being made of very

porous sandy soil, water oozed through them and the whole farm thus became submerged. Some of the standing crops, such as rhea, ginger, turmeric, brinjal, and cotton, which require high well-drained land, were either partially or wholly destroyed. Moreover at the end of the rains it was found that the land that had been brought into condition at considerable expense and trouble, had acquired the consistency of sunburnt bricks, and this threw back potato planting by nearly a month.

(1). Manure experiments were made with paddy with the following results—

1. *Paddy.*

Plot No.	Manures used per acre in lbs.	Price of manures.	Outturn per acre.	Money value of the outturn.	Remarks.
	Field 1.	Rs. A. P.	lbs.	Rs. A. P.	
1	No manure		1,191	14 14 3	
2	Bone-meal, 240 lbs.	6 0 0	2,651	32 14 3	
	Field 2.				
1	Cowdung, 120 bags	3 12 0	3,372	42 4 6	
2	No manure		2,140	26 12 0	
3	Oilcake, 1314 lbs.	2 1 0	3,304½	41 5 0	
	Field 3.				
1	No manure		2,304	28 13 0	
2	Oilcake, 1724 lbs.	2 14 0	2,947	36 13 6	
	Field 4.				
1	No manure		660	8 4 0	
2	Bone-meal, 240 lbs.	6 0 0	1,172	14 10 6	
	Field 5.				
1	No manure		1,302	16 4 6	
2	Bone-meal, 240 lbs	6 0 0	1,668	20 13 6	

The difference in the yield between the manured and the unmanured plots would have been much greater but for the circumstance that all through August the rainfall was scanty, whilst the rainfall in September was much above the average, and this injured the manured plots which were in ear at the time. The unmanured plots, on the other hand, which were very backward, and had not yet put forth blossom, were much benefited by the copious and abnormal rainfall of September. This incident, as Mr. Sen remarks, shows that agricultural experiments must, before anything like positive conclusions can be arrived at from them, be continued for years in order to eliminate the effects of the accidents of season, &c.

2.—*Ginger.*

	Manures used per acre.	Price of manures.	Outturn per acre.	Money value of the outturn.
	lbs.	Rs. A. P.	lbs.	Rs. A. P.
(1) Bone-meal ...	84	2 1 6	1,260	31 8 0
(2) Oilcake ...	126	1 15 6	690	17 4 0
(3) No manure ...	...	.....	1,008	25 3 3

3.—*Brinjal.*

(1) Castor oil cake	240	3 12 0	4,428	69 3 0
(2) Mustard cake	264	4 2 0	4,512	70 8 0
(3) Bone-meal ...	240	6 0 0	3,492	54 11 0
(4) No manure ...	...	.....	2,364	36 15 0

4.—*Fodder grasses.*

	Yield per acre in lbs.	
	Last year.	Present year.
	lbs.	lbs.
(1) Yellow cholum	15,240	23,256
(2) Sorghum	44 280	23,076
(3) Reana luxuruns	11,832	5,720
(4) Loari ghas (Andropogon bladhu Roxb.)	.....	6,720

36. Sorghum as a rain crop has succeeded well at the Burdwan farm, but it is found that it is not worth while to take a second or third cutting, for the

outturn from these cuttings is very insignificant. Yellow cholum gave little better outturn than sorghum; but in speaking of the comparative meris of these grasses, both of which make excellent fodder, it must be remembered that sorghum contains much more sugar than yellow cholum, and that while sorghum is eaten by cattle down to the roots, the lower portion of the stem of yellow cholum is too woody to form cattle food. As in the previous year, reana, which has been so highly spoken of, did not succeed in Burdwan. The seed of the loari ghas was brought by Mr. Sen from the interior of Beerbhoom. The outturn given does not at all represent the normal yield of this grass, which forms excellent cattle food. Some of the seed failed to germinate, and the plants that came up did not cover half the area sown. So far as can be judged from its look and texture, this grass is also likely to prove very valuable thatching and paper-making material.

5.—*Cotton.*

37. Eight different varities of cotton were experimented upon. The plots were manured with bone-meal at the rate of 1,080 lbs. per acre—

	Name of the variety	Yield per acre.
		lbs.
1.	Nankin	370½
2.	Deba Lonacinu	97½
3.	Lonacinu	468
4.	Kapasia	156
5.	Upland	136½
6.	New Orleans	156
7.	Hill Tipperah } Failed to germinate.	
8.	Garo Hills }	

38. It will be noticed that, unlike previous experiments in Burdwan and unlike experiments made in other districts, very good results were obtained with Nankin cotton this year in the Burdwan farm. The plants look quite healthy, and proved more hardy than any other varieties experimented upon. They have put forth new shoots and leaves, and a second crop is expected. Experiments on the cultivation Nankin cotton were also tried in Mozufferpore and Hill Tipperah, but without success. Mr. Sen at first tried Nankin cotton as a winter crop, and as such it did not germinate; but planted in the beginning of the rainy season, in drills 30 inches apart, and manured with bone-meal, Nankin cotton, as the figures quoted above show, gave very good results. I do not, however, think it will ever be extensively grown in Bengal.

6.—*Effect of bone-meal on gram.*

		Manures used per acre.	Price of manure.	Outturn per acre	Money value of the outturn.
		lbs.	Rs.	lbs.	Rs. A. P.
(1)	Bone-meal	120	3	833	15 6 0
(2)	No manure	..	...	556⅔	10 5 0

7.—*Turmeric.*

		lbs.	Rs. A. P.	lbs.	Rs. A. P.
(1)	Bone powder	300	7 8 0	5,850	45 11 3
(2)	No manure ...	...	... ..	4,900	38 1 6

8.—*Ground nuts.*

Cost of cultivation per acre.	Yield per acre.	Money value of yield.	Net profit per acre.
Rs. A. P.	lbs.	Rs. A. P.	Rs. A. P.
86 1 6	2,585½	129 4 6	43 3 0

9.—*Sugarcane.*

39. Much time and care were bestowed on sugarcane experiments in the Burdwan farm, as this crop forms one of the most important products of the Division; but so much injury was done to the plants at the first stage by white-ants, with which the whole farm and its neighbourhood abound, owing probably to the place having remained uncultivated and overgrown with weeds for years, that no stress can be laid on the figures given below as a criterion of the relative values of the various manures used. The results prove, however,

that the cultivation of sugarcane without manure on soils similar to that of the farm will entail loss:—

Manures used per acre in lbs.	Price of manures.	Weight of canes.	Weight of juice per acre.	Weight of gur per acre.	Price of gur.	Remarks.
	lbs.	Rs. A. P.	lbs.	lbs.	Rs.	Rs. A. P.	
1. Super	528	33 6 0	28,848	17,472	4,536	226 12 9	
Saltpetre	180						
2.* Mustard cake	1,200	37 8 0	28,016	18,672	4,872	243 9 9	
Castor cake	1,200						
3. Super	528	33 6 0	20,892	13,296	3,300	115 0 0	
Saltpetre	180						
4. Mustard cake	1,200	37 8 0	18,242	10,800	2,880	144 0 0	
Castor cake	1,200						
5. Super	528	33 6 0	18,216	10,944	2,316	115 12 9	
Saltpetre	180						
6. Bone-meal	576	31 4 6	16,920	8,760	2,580	129 0 0	
Saltpetre	180						
7. Bone powder . ..	120	19 14 0	10,080	7,474	1,506	75 5 0	
Saltpetre	180						
8. Oilcake	2,400	37 8 0	12,810	8,316	1,740	87 0 0	
9. Oilcake	2,400	37 8 0	13,500	6,372	1,560	78 0 0	
10. Super	600	32 13 0	21,390	13,050	3,420	171 0 0	
Oilcake	900						
11. Oilcake	3,360	52 8 0	40,008	20,424	6,864	343 3 3	
12. Super	720	47 6 0	23,628	15,000	3,744	187 3 3	
Saltpetre	252						
Gypsum	240						
13. Saltpetre .	252	39 14 0	21,984	14,724	3,792	189 10 6	
Bone-meal	600						
Gypsum	240						
14. No manure		.. .	2,496	1,440	312	15 10 6	

40. *Gur-making.*—Taking up the suggestion made by him in his last annual report, Mr. Sen imported from Behcea two mills, a pair of boiling pans one centrifugal sugar-dryer, and a competent man to make gur. The gur made at the farm has been pronounced by cultivators and tradesmen, as well as by the consumers of it, to be far superior to what can be had in the Burdwan Division, but the price realized for it is not proportionately high.

Mr. Sen is of opinion that the centrifugal sugar-dryer, invented by Messrs. Mylne and Thompson of Behcea, which has been so highly spoken of in some quarters, is not at present likely to come into general use in Bengal, the tendency in Bengal being, he says, towards an increasing consumption of refined sugar and not towards consumption of brown, coarse sugar such as is turned out by the dryer.

10.—*Potatoes.*

41. (*a*) *Manure Experiments.*—The same variety of potatoes, namely, the acclimatised *magnum bonum*, was experimented upon in different plots in order to ascertain the relative values of various manures. The several plots were manured differently, but in other respects received the same treatment :—

Manures used per acre.	Price of manures.	Outturn per acre.	Remarks.
	lbs.	Rs. A. P.	lbs.	
1 Oilcake	960	15 0 0	4,960	
2 Bone-meal	480	27 0 0	8,960	
Oilcake	960			
3 No manure	.....		3,040	
4 Bone-meal	960	24 0 0	7,200	
5 Oilcake	1,920	30 0 0	5,110	
6 Super	120	15 0 0	7,680	
Saltpetre	120			
7 Super	81	20 4 0	9,280	
Saltpetre	90			
Bone-meal	360			
8 Bone-meal	480	19 8 0	10,400	
Oilcake	480			

Positive conclusions cannot be come to from the experiments of a year or two; but so far as these experiments go, they show the great value of bone-meal as a manure for potatoes. Bone-meal, costing Rs. 24 per acre, has given an increase of yield of 4,160lbs, or fifty-one maunds per acre, which, valued at the very moderate rate of Rs. 1-8 per maund, would represent a profit of Rs. 75-8 per acre, whether used singly or mixed with other manures. So far as could be judged from the appearance of the plants, the oilcake plot

was best; but when the crop was raised, it was found that the growth of the tubers had not been as good as the appearance of the stalks would indicate. It is to be noticed that the addition of bone-meal increased the yield of even the superphosphate plot. These results were not quite unexpected, for they are known to the most advanced growers of potatoes in England. But what is the most unexpected and noticeable feature of these experiments is the fact that, whereas the tubers of plots receiving bone-meal as manure, either singly or mixed with other manures, were quite free from disease, the potatoes of other plots, though placed side by side with the former, in some cases even intervening with them, were more or less diseased. The plots were all planted on the same day from the same supply of seed.

42. (*b*).—*Different varieties of potatoes under the same treatment.*

	Varieties.	Outturn per acre.
		lbs.
1.	*Magnum bonum* acclimatized	3,320
2.	Country	2,760
3.	Darjeeling hill	4,410
4.	Naini Tâl hill	4,020

Experiments made at the Burdwan farm, as well as in Government and other estates, have proved that by the use of English potato seed, either imported directly from England or acclimatized in hill stations, a crop heavier in quantity and better in quality can be obtained than is possible with the ordinary country seed. At the last potato-growing season, a considerable demand for English potato seed sprung up in the Burdwan Division as well as elsewhere, in consequence of experience of results of experiments made with this seed under Mr. Sen's instructions in the previous year, but the supply fell short of the demand. To supply potato cultivators of the plains with seed of better quality than is ordinarily available, Mr. Sen has suggested the establishment of a farm in the Darjeeling hills for the cultivation of potatoes from seeds imported from England. He has now been instructed to proceed to Darjeeling and report if anything can be done to supply this want, and at the same time to enquire into the spread of disease which is causing great loss to potato-growers in the Darjeeling hills.

Dumraon Experimental Station.

43. In the experimental station attached to the home farm of the Maharajah of Dumraon, experiments were made with paddy, wheat, and sugarcane. These crops were grown in parallel plots treated differently as regards seeds, mode of cultivation and manuring, and the outturn of each plot was accurately noted in order to ascertain comparative results. There were 24 plots under experiment in 1885-86, and 15 plots were added last year. Of these 39 plots, 14 were under paddy, 4 under sugarcane, and the rest under wheat. Besides these, there were 7 plots under experiment in Bhojpur.

Statement showing Treatment and Results of the experimental plots sown with Paddy.

Number of plot.	Treatment.	Produce per acre.	
		Grain.	Straw.
		lbs.	lbs
1A	Deep ploughed ...	650	1,681
1B	Shallow ploughed ...	556	911
2A	Manured with cowdung at the rate of 180 maunds per acre ...	665	1,228
2B	Unmanured	571	1,061
3A	Manured with sweepings at 180 maunds per acre	674	1,195
3B	Unmanured	605	1,195
4A	Manured with crude saltpetre at 3 maunds per acre ...	856	1,533
4B	Unmanured	493	961
4C	Sown after plough	526	928
7A	Manured with crude saltpetre and transplanted with seedlings...	971	1,851
7B	Unmanured and transplanted with seedlings ...	505	928
8A	Manured with crude saltpetre at 3 maunds per acre and lime at 9 maunds per acre.	1,191	2,399
8B	Manured with cowdung at 18 maunds per acre and lime 9 maunds per acre.	744	1,258
8C	Manured with lime only	514	931

As in the previous year, all the plots which received special treatment gave an increased yield over plots treated in the ordinary way. The plot manured with crude saltpetre and lime gave the largest outturn. A comparison of plot 7A with 4A shows the advantage of transplanting seedlings over broadcasting. Deep ploughing gave an increase over shallow ploughing, but it is to be observed that the increase is far greater in straw than in grain.

44. *Sugarcane Experiments.*

Number of plot.	Area in square yards.	Treatment.	Outturn per acre	
			Sugar	Jagri.
			lbs.	lbs.
6A	1,350	Planted out in trenches and manured with crude saltpetre.	1,100·65	828·2
6B	1,600	Unmanured and planted in trenches	505·1	1,004·3
9A	.. ...	Manured with crude saltpetre and sown in the native way.	1,228·1	553 6
9B	.....	Sown in the native way and unmanured ...	535 4	704·9

In the case of sugarcane, as in that of paddy, the use of crude saltpetre as a manure gave an enormously increased yield; but the net profit resulting from the special treatment cannot be stated. The variety planted was that locally known as mungo, and cultivation according to the Mauritius system, recommended by Messrs. Mylne and Thompson, gave better results than the native method and is less expensive.

45. *Wheat*, 1886-87.

No. of plot.	Area in square yards.	Kind of wheat.	Treatment.	Outturn per acre.	
				Grain.	Straw.
5A	1,600	Local red ...	Deep-ploughed	529·4	804 6
5B	.....	.....	Shallow ploughed	420·5	680·6
10A	.....	Dumraon prize wheat	Watered from well . ..	813·9	992·2
10B	.....	...	,, ,, canal	659 4	928 6
11A	800	Mozuffernagur	Green manured with hemp in 1885-86	592 9	992·2
11B	.....	.....	Ditto ditto 1886-87	810·7	1,113·2
12A	1,600	.....	Manured with ashes	804·6	937 7
12B	.....	.....	,, ashes and crude saltpetre ...	974 05	1,052 7
12C	.....	Local wheat ...	,, with cowdung	611·05	744·1
12D	.....	.....	,, bones	568 7	686 8
12E	....	Buxar	,, with crude saltpetre ...	1,512·6	1,984 4
12F	.....	.....	Unmanured	517·3	556 6
13a	.....	Mozuffernagur ...	Shallow-ploughed	789 5	928·6
13b	.....	Local red ...	Ditto	623·1	744·1
14A	400	Mozuffernagur ...	Manured with lime	713 9	763·1
14B	.....	.....	Ditto and crude saltpetre	1,355·5	1,234·2
14C	.... .	Buxar	Ditto	713·9	871·2
14D	.....	.....	Ditto and crude saltpetre	103·5	992 2
14E	... ..	Local	Ditto ditto ...	1,173·7	2,480·5
14F	. ...	...	Manured with lime	580·8	738 1
15	1,200	Mozuffernagar ...	Ditto with crude saltpetre ...	1,028·5	1,443·9

Bhojpore Farm.

No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No.
	Country maize.	Canada corn.	Mozuffernagur wheat	Mozuffernagur wheat.	Buxar white wheat.	Buxar white wheat.
Treatment.	*Treatment.*	*Treatment.*	*Treatment.*	*Treatment.*	*Treatment.*	*Treatment.*
Unmanured and sown with Sorghum.	Unmanured.	Unmanured.	Unmanured	Saltpetre ... 20 seers	Unmanured.	Saltpetre .. 20 seers
Outturn.	*Outturn.*	*Outturn.*	*Outturn.*	*Outturn.*	*Outturn.*	*Outturn.*
1886-87.	1886-87.	1886-87.	1886 87.	1886-87	1886-87.	1886-87.
Grain ... 16lbs.	Grain 191lbs.	Grain ... 10lbs.	Grain 384lbs.	Grain ... 303lbs.	Grain 321lbs.	Grain 332lbs.
Stalks 1,921 ,,	Stalks ... 776 ,,	Stalks 57 ,,	Straw ... 410 ,,	Straw ... 507 ,,	Straw .. 390 ,,	Straw ... 572 ,,

The average outturn of wheat over the whole farm was last year 913·7lb. per acre, which is 471·7lb. less than the average outturn of the preceding year.

The season was extremely unfavourable to wheat on this farm. In the first place rainfall was abnormally heavy at sowing time and continued late, and the land could not be ploughed more than two or three times, while in the preceding year it was ploughed five or six times; *secondly*, the crop, when it was coming into flower, was affected with rust or harda, which rendered the grain light and ears thin; and, *thirdly*, when the crop was ready for cutting, a heavy fall of rain and hailstones destroyed about one-fourth of the produce. It will be observed that, as in the previous year, crude saltpetre, applied as a manure at the rate of three maunds per acre and costing Rs. 14-1, gave an increased yield of 12 maunds valued at Rs. 20 per acre.

46. The following statement shows the results of experiments made at Bhagulpore by Mr. Hossein:—

Table showing Results of Experiments with Manures in Cantonment grounds in Bhagulpore.

1	2	3	4	5		6		7
Name of plot.	Area in square yards.	Name of crop or crops grown.	Treatment.	Outturn per plot in lbs.		Outturn per acre in maunds and seers.		Remarks.
				Grain.	Straw.	Grain.	Straw.	
						Mds. Srs.	Mds. Srs.	
A	1,600	1. Gram (bunt) ... 2. Linseed (chikna)	Bone-meal applied	341 270 14 ..		13 0 0 21	10 8	One maund bone-meal, price Rs. 2.
a	..	1 Gram (bunt) 2. Linseed (chikna)	No manure ..	218 200 17 ..		8 10 0 25½	7 22½	
B	.	1. Gram (bunt) 2. Linseed (chikna) . .. 3. Mustard (gota) . ..	Oilcake applied	415 286 12 ... .. 13		18 27½ 0 18 0 19½	10 32½	Oil cake, 30 seers.
b	.. .	1. Gram (bunt) ... 2. Linseed (chikna) .. 3. Mustard (gota)	No manure ...	295 230 14 .. 20		11 6 0 21 0 30	8 27½	
C	. ...	1. Gram (bunt) 2. Local wheat	Ploughed in green hemp.	445 520		16 31	19 26½	Sown, reaped, and mixed together as is usual in this part
c	.....	1. Gram (bunt) .. .. 2. Local wheat	No manure	340 370		12 34	13 30½	Ditto ditto.
D	...	1. Gram (bunt) 2. Linseed (chikna) .. 3. Mustard (gota) ..	Bone-meal applied	377 240 12½ 15		14 5 0 10 0 22½	11 23½	Bone-meal, 2 maunds.
d	..	1. Gram (bunt) ... 2. Linseed (chikna) 3. Mustard (gota)	No manure	359 250 14 9 .. .		12 32½ 0 21 0 13½	9 18	
e		1. Buxar wheat	Oilcake applied ...	93 118		3 20½	5 23½	Oilcake, 30 seers.
f	. .	1. Ditto ...	No manure ...	105 100		3 38½	6 2	
g	.....	1. Ditto ...	Bone-meal applied	193 180		5 1	6 32	Bone-meal, 1 maund.

The land on which these experiments were made in Bhagulpore is not typical of the district, and they will now be discontinued.

Experiments made through ryots and zemindars.

47. As in the preceding year, a number of experiments to test the effect of different manures on some of the most important crops of the Burdwan Division were conducted by Mr. A. C. Sen through ryots and talukdars. Experiments were also made to ascertain what the possibility may be of successfully cultivating English potatoes in the plains of Bengal. Mr. Sen has always been of opinion that experiments capable of yielding scientifically accurate results, and on which general conclusions may be safely based, cannot be made through either ryots or zemindars. And the results of his second year's experiments have served only to confirm his belief. The following statement shows the reported

results of experiments made in this way, but the figures cannot be accepted with confidence :—

(1) *Experiments to test the value of Bone-meal and other manures on Paddy.*

Localities.	Manure used per acre in lb.	lb.	Price of manures. Rs. A. P.	Outturn per acre. lb.	Money value of the outturn. Rs. A. P.	Remarks.
Nandingram ...	1 Oilcake	360	6 3 0	2,640	33 0 0	
	2 Bone-meal	240	6 0 0	4,800	60 0 0	
	3 Super ... ... / Saltpetre	90 / 15	4 5 0	4,800	60 0 0	
	4 Super ... ... / Saltpetre	90 / 15	4 5 0	2,880	36 0 0	
Khanyan	1 Bone-meal	240	6 0 0	2,400	30 0 0	
	2 Oilcake ... ... / Bone-meal	180 / 120	6 3 0	2,880	36 0 0	
	3 Super ... ... / Saltpetre	120 / 30	6 7 6	3,240	40 8 0	
	4 Oilcake ... ... / Super	180 / 60	5 3 9	2,400	30 0 0	
	5 Bone-meal ... ... / Hide salt	180 / 45	4 12 3	1,800	22 8 0	
	6 Bone-meal ... ... / Saltpetre	180 / 30	6 5 6	2,800	35 0 0	
	7 Oilcake ... ... / Super	144 / 48	4 3 6	2,400	30 0 0	
	8 Bone-meal ... ... / Hide salt	200 / 30	5 11 3	3,200	40 0 0	
Hargram	1 Bone-meal	240	6 0 0	1,440	18 0 0	
	2 Oilcake	360	5 10 0	2,430	28 0 0	
	3 Dung	4,800	3 12 0	1,600	20 0 0	
	4 No manure	...	...	1,440	18 0 0	
	5 Oilcake	360	5 10 0	2,160	27 0 0	
	6 Bone meal ... ... / Saltpetre	180 / 36	7 14 0	1,920	24 0 0	
	7 Super ... ... / Saltpetre	144 / 36	7 14 0	2,880	36 0 0	
	8 Oilcake ... ... / Bone-meal	180 / 72	4 8 0	1,680	21 0 0	
	9 Oilcake	360	5 10 0	2,160	27 0 0	
	10 Bone-meal ... ... / Saltpetre	180 / 36	7 14 0	1,920	24 0 0	
	11 Super ... ... / Saltpetre	144 / 36	7 14 0	2,880	36 0 0	
	12 Oilcake ... ... / Bone-meal	180 / 72	4 8 0	1,680	21 0 0	
Moynah	1 Oilcake	360	5 10 0	1,200	15 0 0	
	2 Bone-meal	240	6 0 0	1,440	18 0 0	
	3 Bone-meal ... ... / Saltpetre	120 / 18	4 11 0	1,080	13 8 0	
	4 Super ... ... / Saltpetre	100 / 20	5 0 0	1,200	15 0 0	
Nabagram ...	1 Super ... ... / Saltpetre	180 / 30	8 7 0	480	6 0 0	
	2 Bone-meal ... ... / Saltpetre	180 / 30	7 5 0	384	4 13 6	
Panduah ...	3 Oilcake	240	3 12 0	480	6 0 0	
	1 Bone-meal	240	6 0 0	2,400	30 0 0	
	2 Oilcake	360	5 10 0	2,400	30 0 0	
	3 Super ... ... / Saltpetre	180 / 30	8 7 0	3,000	37 8 0	
Jowgram	1 Bone-meal	240	6 0 0	1,200	15 0 0	
	2 Bone-meal ... ... / Oilcake	120 / 180	6 1 6	960	12 0 0	
Nawadia ..	1 Oilcake	360	5 10 0	2,700	33 12 0	
	2 Bone-meal	240	6 0 0	1,740	21 12 0	
	3 Super ... ... / Saltpetre	180 / 30	8 5 6	2,520	31 8 0	
Ajhapore ...	1 Bone meal	225	5 14 0	1,200	15 0 0	
	2 Super ... ... / Saltpetre	120 / 30	6 7 6	3,360	42 0 0	
	3 Bone-meal ... ... / Saltpetre	112½ / 30	5 10 0	1,080	24 12 0	
	4 Super	180	5 10 0	2,070	33 6 0	
Government villages—						
(a) Belcooli—						
I	1 Dung	4,800	3 12 0	1,680	21 0 0	
	2 No manure	...	...	1,200	15 0 0	
	3 Oilcake	480	7 8 0	1,800	22 8 0	
II	4 Oilcake	480	7 8 0	1,788	22 5 0	
	5 No manure	..	...	1,140	14 4 0	
	6 Bone-meal	240	6 0 0	1,620	20 4 0	
III	7 Bone-meal	240	6 0 0	1,7 0	21 6 0	
	8 No manure	...	.....	1,140	14 4 0	
	9 Bone-meal ... ... / Oilcake	120 / 240	6 12 0	2,100	26 4 0	
IV	10 Bone-meal	240	6 0 0	1,650	21 0 0	
	11 No manure	...	.....	1,215	15 6 0	
	12 Bone-meal ... ... / Saltpetre	180 / 60	12 0 0	1,980	24 12 0	
(a) Belcooli V	13 Oilcake	480	7 8 0	1,680	21 0 0	
	14 No manure	...	.....	1,200	13 2 0	
	15 Super ... ... / Saltpetre	240 / 60	13 8 0	2,340	29 4 0	
(b) Pearapore I	1 Dung	4,800	3 12 0	1,560	19 8 0	
	2 No manure	.	.....	1,140	14 4 0	
	3 Oilcake	480	7 8 0	1,752	21 14 0	
II	4 Oilcake	480	7 8 0	1,740	21 12 0	
	5 No manure	.	.....	960	12 0 0	
	6 Bone-meal	240	0 0	1,530	19 2 0	
	7 Bone-meal	24	6 0 0	1,788	22 5 0	
III	8 No manure	...	.....	1,200	15 0 0	
	9 Bone-meal ... ... / Oilcake	120 / 240	6 12 0	1,800	22 8 0	
IV	10 Bone meal	240	6 0 0	1,740	21 12 0	
	11 No manure	...	.....	1,200	15 0 0	
	12 Bon-meal ... ... / Salpetere	18 / 60	12 0	1,920	24 0 0	

Localities.		Manures used per acre in lb.		Price of manures.	Outturn per acre.	Money values of the outturn.	Remarks.
			lb.	Rs. A. P.	lb	Rs. A. P.	
V	13	Oilcake	480	7 8 0	1,800	22 8 0	
	14	No manure	...	... ..	1,140	14 4 0	
	15	Super	240	13 8 0	2,493	31 3 3	
		Saltpetre	60				
(c) Moolpore ... I	1	Dung	4,800	3 12 0	1,680	21 0 0	
	2	No manure	...	.....	1,230	15 6 0	
	3	Oilcake	480	7 8 0	1,680	21 0 0	
II	4	Oilcake	480	7 8 0	1,710	21 6 0	
	5	No manure	...	.....	1,200	15 0 0	
	6	Bone-meal	240	6 0 0	1,710	21 6 0	
III	7	Bonemeal	240	6 0 0	1 830	19 2 0	
	8	No manure	...	.....	1,080	13 6 0	
	9	Bone-meal	120	6 12 0	1,680	21 0 0	
		Oilcake	240				
IV	10	Bonemeal	240	6 0 0	1,800	22 8 0	
	11	Unmanured	...	.....	960	12 0 0	
	12	Bone-meal	180	12 0 0	1,860	23 4 0	
		Saltpetre	60				
	13	Oilcake	480	7 8 0	1,800	23 4 0	
	14	No manure	...	.....	1,500	19 8 0	
	15	Super	240	13 8 0	2,910	36 6 0	
		Saltpetre	60				
(d) Peasura— I	1	Dung	4,800	3 12 0	1,320	16 8 0	
	2	No manure	...	... .	960	12 0 0	
	3	Oilcake	480	7 8 0	1,710	21 6 0	
II	4	Oilcake	480	7 8 0	1,722	21 8 3	
	5	No manure	...	.....	1,050	13 2 0	
	6	Bone-meal	240	6 0 0	1,680	21 0 0	
III	7	Bone-meal	240	6 0 0	1,692	21 2 6	
	8	No manure	...	... .	1,200	15 0 0	
	9	Bonemeal	120	6 12 0	1,680	21 0 0	
		Oilcake	240				
IV	10	Bonemeal	240	6 0 0	1,560	19 8 0	
	11	No manure	...	... ..	1,140	14 4 0	
	12	Bone-meal	180	12 0 0	1,800	22 8 0	
		Saltpetre	60				
V	13	Oilcake	480	7 8 0	1,620	20 4 0	
	14	No manure	...	.....	1,440	18 0 0	
	15	Super	240	13 8 0	2,442	30 8 6	
		Saltpetre	60				

48. It will be noticed that bone-meal proved to be a very good manure when applied to paddy. But this is shown not so much by the figures given above as by the steadily increasing demand for this manure in villages where it was used in the preceding year, and this notwithstanding the strong aversion to the introduction of it expressed in some of the vernacular newspapers. Mr. Sen reports that he could have introduced this manure to almost any extent among the cultivators of the Burdwan Division, but for the fact that the price demanded by the Bally and other factories is somewhat higher than is paid for oilcake. It is now intended to make an experiment with fermented bones, to see if the price can be reduced. But it is unlikely that Indian ryots, generally speaking, will take the trouble to collect and ferment bones for themselves. If bone manure so treated is to take the place of bone-meal, there must be a special agency to ferment and grind bones on a large scale, and then sell them in the same way as bone-meal is now being sold.

49. Under special conditions a mixture of superphosphate of lime and crude saltpetre may with great advantage be applied to paddy as a topdressing; but so long as sulphuric acid sells at its present extremely high price in India, there is not much chance of super coming into general use. The highness of the price of sulphuric acid is more to be regretted for, as will be seen afterwards, super has proved an excellent manure for sugarcane on strong clay land. It is satisfactory to note that Mr. Sen sold during the period under report more than 100 maunds of bone-meal to ryots of the villages in which he had distributed small qualities of it *gratis* during the previous year, and the ryots of these villages are now keenly interested in watching the results of the use of this manure. It is with a view to enable them in this way to judge for themselves, and not for the purpose of obtaining accurate statistical results, that I have advocated, through the agency of ryots and zemindars

themselves, the conduct on a small and inexpensive scale, of such well-considered experiments as are likely to show profitable results.

50. 2.—*Results of Sugarcane Experiments.*

Localities.	Manures used per acre.	lbs.	Price of manures. Rs. A. P.	Outturn per acre.	Money value of the outturn. Rs. A. P.	Remarks
Burrabar .	1 Oilcake	2,400	37 8 0	4,800 lbs.	.....	
	2 Super	528				
	Saltpetre	180	36 6 0	7,200		
	Lime	480				
	3 Oilcake .	960	27 0 0	Destroyed by flood.	360 0 0	The land is strong clay
	Bone-meal	480		Ditto.		
	4 No manure		.....			
Government villages—						
(a) Belcooli ...						
	A Oilcake	2,400	37 8 0			
	B. Super	528				
	Saltpetre	180	34 14 0	Average of all plots, 3,840 lbs.	192 0 0	Through the neglect of the tehsildar, who was put in charge of these experiments, the results have not been properly recorded.
	Gypsum	360				
	C. Bone-meal	600				
	Ashes	480	18 0 0			
	Gypsum	240				
	D. Bone meal	600				
	Saltpetre	180	34 2 0			
	Gypsum	360				
(b) Moojpore ..	A. Oilcake	2,400	37 8 0	Average of all plots, 5,280 lbs.	264 0 0	
	B. Super ..	528				
	Saltpetre . ..	180	34 14 0			
	Gypsum	240				
	C. Bone-meal	600				
	Ashes ...	480	18 0 0	Average of all plots, 5,280 lbs.	264 0 0	
	Gypsum	240				
	D. Bone meal	600				
	Saltpetre	180	34 2 0			
	Gypsum	360				
(c) Navina .	A. Oilcake	2,400	37 8 0			
	B. Super	528				
	Saltpetre	180	34 14 0			
	Gypsum ...	360				
	C Bone-meal	600		Average of all plots, 2,880 lbs.	140 0 0	
	Ashes .	480	18 0 0			
	Gypsum	240				
	D. Bone-meal	600				
	Saltpetre	180	34 2 0			
	Gypsum	360				
(d) Pearapore	A. Oilcake	2,400	37 8 0			
	B. Super	528				
	Saltpetre	180	34 11 0			
	Gypsum	360				
	C. Bone meal	600		Average of all plots, 4,800 lbs.	240 0 0	
	Ashes	480	18 0 0			
	Gypsum	240				
	D. Bone-meal	600				
	Saltpetre	180	34 2 0			
	Gypsum	360				

51. *Potato Experiments made by Ryots in Government villages.*

The variety experimented upon was acclimatized *magnum bonum*.

Name of the village.	Yield per acre. lbs.	The average yield of country potatoes is. lbs.
Belcooli	9,600	9,600
Moojpore	14,400	
Nabina	30,000	
Peasarah	9,600	
Burdwan.		
Through a talukdar ...	16,800	.....

52. *Experiments made through Ryots and Zemindars in Bhagulpore.*
Introduction of Buxar wheat.

Experiments were also made by Mr. Hosein with Buxar wheat through zemindars and others, with a view to introduce this variety of wheat into the Bhagulpore Division. It was stated in the last year's report that Buxar seed sown in Bhagulpore yielded a grain described by the Committee of the Wheat and Trades Association to be a 'splendid description of wheat, soft, mellow, bold, regular and of good colour, and six annas a maund superior in value to the local Bhagulpore grain.' This led many zemindars and others to apply for this variety of wheat for experimental cultivation. One substantial cultivator alone applied at first for 15 maunds of seeds, and later on for 50 maunds more, and some Rajput cultivators in Monghyr applied for 135 maunds of this seed, and were supplied with it at their own expense. Samples of wheat thus grown in Bhagulpore and Monghyr were sent for appraisement to the Wheat and Trades

Association, and have been found to be superior to that locally grown, though not of so high quality as that obtained last year in Bhagulpore. As regards this difference in the results of the two years, it should be remarked that the Wheat and Trades Association report that, owing to unfavourable rainfall, there was a general falling off in the quality of wheat grown throughout the Bhagulpore Division last cold season. One of the zemindars who imported Buxar seed into Bhagulpore was so well satisfied with the results that he will now grow no other, and, as Mr. Hossein informs me, has expressed a desire to import 500 maunds more of it for seed this year. The experimental cultivation of Buxar wheat was also tried in other districts, but not with so much success as in Bhagulpore, and applications for further supplies of it are now being received.

FIBRES.

53. It was stated in my last annual report that, at the request of the Government of India, the Agri-Horticultural Society of India conducted certain experiments in the cultivation of rhea and other fibre plants and in extraction of fibre, with a view to ascertain the relative merits, the cost of cultivation, and what possibility there may be of growing them as commercial products. The Society have since submitted their final report.

The experiments were continued for two years, and the fibre-bearing plants experimented upon were the following—

(1) Hibiscus esculentus.
(2) Hibiscus abelmoschus.
(3) Abutilon indicum.
(4) Bœhmeria nivea.
(5) Sida rhombifolia.
(6) Abroma augusta.
(7) Sansivera zeylanica.
(8) Musa paradisica.

Of the above, the first and the eighth gave good crops, Hibiscus abelmoschus being specially good. The Sida grew rather branchy and tangled. Hibiscus esculentus, Abutilon indicum, and Bœhmeria nivea were thin in low-lying places.

The Sansivera zeylanica made little or no progress, showing the uselessness of cultivating it in an open and unsheltered position; it is likely to do better in shady places.

For the extraction of fibres a Death and Ellwood machine alone was used in the first as well as the second trial. This machine was found totally unsuited for dealing with some of the fibres. The results of the trial with this machine are given in the following tables:—

Trials with Death and Ellwood's Machine.

Name of Plant.		Area from which cut, sq. feet.	Green plant, lbs.	Dry fibre, lbs.	Percentage of fibre.
Botanical.	Vernacular.				
Hibiscus abelmoschus (musk mallow)	Kasturi ...	300	456	6	1·31
Abutilon Indicum	Petári ...	2,574	265	8	3·01
Hibiscus esculentus	Dheros ...	11,657	1,194	22½	1·88
Sansiviera Zeylanica	Múrva ...	1,330	380	1½	39
Musa paradisica (plantain)	Kach-kela ...	.....	436	3	·68
Pineapple	.....	.....	158	1	·63
Bœhmeria nivea (Rhea) imperfectly cleaned. Great waste.					
Sida rhombifolia (*Barela*) could not be cleaned with machine.					

From the foregoing data, the following may be given as the yield of fibre per acre of the different plants treated with a Death and Ellwood machine.

Yield per acre fibre extracted with a Death and Ellwood Machine.

		Md.	S	lbs.
Hibiscus abelmoschus	Kasturi ...	10	35	871
Abutilon Indicum	Petári ...	1	27½	135
Hibiscus esculentus	Dheros ...	1	2½	84½
Sansiviera Zeylanica	Múrva ...	.....	21¼	49⅗

Some of the fibres were also extracted by the *retting* process, and the results of this process are collected in the following tables:—

Fibre prepared by the retting process.

	Area.	Plant.	Fibre.	Per cent
	Sq. ft.	lbs.	lbs.	
Hibiscus abelmoschus	22,000	7,575	501½	6 61
Ditto after seeding ...	20,000	3,320	400	12 04
Abutilon Indicum	27,600	3 860	322	8·34
Hibiscus esculentus	3,640	2,581	43	1·66
Sida rhombifolia	10,400	2,560	105	4 10

According to these data, the yield per acre of fibre should be—

	Mds.	s.	c.
Hibiscus abelmoschus	12	17	0
Ditto seeded	10	35	8
Abutilon Indicum	6	14	0
Hibiscus esculentus	6	17	4
Sida rhombifolia	5	19	8

The following table compares the results of the *retting* process with that obtained with the Death and Ellwood machine:—

	Death and Ellwood Machine.	Retting.
	Maunds.	Maunds.
Hibiscus abelmoschus	10—35	12—17
Abutilon indicum	1—27½	6—14
Hibiscus esculentus	1—2¼	6—17—4

It will be seen that the *retting* process gave a better outturn.

The Society have arrived at the conclusion that the cultivation of Hibiscus, Abutilon, Sansivera and Sida has no advantage over that of jute.

From the above summary of the final report submitted by the Society, it appears that, though the experiments conducted by them have thrown considerable light on the question of the cultivation of some fibre-yielding plants, and the extraction of fibres generally, yet sufficiently accurate information has not yet been obtained on any of the three points which it was the object of these experiments to supply. In order to bring the questions under consideration to a more crucial test, the land leased by the Society for the purpose of these experiments, together with the stock of Rhea, Sansivera and plantain trees upon it, has been handed over to Messrs. Ewing and Company, who have taken up the investigation as regards the most important of the fibres, viz. rhea, at their own cost, and have undertaken to report the results. If they find them to be satisfactory as they report to be likely, they will no doubt take up the question of manufacture of rhea as a Commercial product in a practical manner.

Another experiment in the same direction is being tried by Mr. Maries of Durbhunga, who, it is believed, has satisfied himself that a process discovered by him for the extraction and cleaning of rhea fibre can be worked at a profit.

Cost of agricultural inquiry improvement and experiments.

54. The total nett cost to Government of expenditure on agricultural inquiry, experiment, improvement, agricultural implements and distribution of seed, apart from cost of establishment and of what has been done at the expense of private individuals, amounts only to Rs. 6,860.

Chaptlr VI.—Cattle-breeding and Veterinary Establishments.

55. Mention was made in my first annual report of the fact that, pending completion of arrangements for the Provincial Contract, it was found necessary by the Government of India, for financial reasons, to refuse its sanction to a scheme which had been prepared for the establishment of a veterinary school in Bengal. The terms of the Provincial Contract may have since been settled,

but in the present state of the Bengal finances it is believed that it would be useless to re-open this question. Nothing therefore has been done, and nothing seems to be at present possible in the matter of opening the proposed veterinary school, or of providing an agency for treatment of disease among cattle. This department cannot, under these circumstances, do anything towards the prevention or cure of disease among cattle of which outbreaks are now being constantly reported by local officers.

Two Hissar bulls were supplied for use on the Government estates in Arrah and Sasseram, and two half-bred English bulls were presented to Government by Dr. Greenhill. Of these, one, out of a fine country cow by Zooloo, an imported Jersey bull, has been made over to the Manager of the Burdwan Raj, and the other, out of a fine Hansy cow by an imported Durham bull was given to the Arrah Municipality, that body having undertaken to provide for the maintenance and custody of the animal, and to report through their Chairman whether any improvement in the local breed of cattle may be effected by means of it. These are but isolated and insignificant efforts, but to anybody who is acquainted with the improvement effected by Mr. Taylor, when Commissioner of Patna, in the breed of cattle in that locality by the introduction of one or two English bulls—an improvement which is visibly marked up to this day—it will be apparent that even isolated efforts of this kind may effect some good, and if other municipalities and public bodies would follow the example set by the Arrah Municipality, and would interest themselves in seizing and weeding out such of those wretched country bulls as are diseased, and now roam about spreading disease wherever they go, and if they would keep for public use, in local pounds or elsewhere, a suitable and superior class of sires, which might be procured for them at their expense by Government, much might be effected towards improving the breed of cattle in these Provinces, without entailing any expenditure on the State. But if the more enlightened and representative portion of the community will take no interest in this, or similarly important questions, and if something of the kind cannot be done, I am unable to see how the Agricultural Department, as at present constituted, can do anything substantial towards improving the breed of cattle in Bengal.

Chapter VII.—Agricultural and Financial Statistics.

56. A special report has been submitted on the subject of the collection of agricultural statistics in Bengal, and is now awaiting orders of Government.

Price-lists under the Tenancy Act.

57. A special report has also been submitted on the subject of preparation both of price-lists under the Tenancy Act and of the fortnightly return of prices-current of food-grains. Enquiries made in connection with the preparation of price-lists under the Tenancy Act have shown that great diversity of practice, and much laxity of procedure, exist in the preparation of the fortnightly returns of prices of food-grains now published in Gazette. Suggestions for introduction of greater uniformity in the preparation of the returns, and for securing greater accuracy in the entries contained in them, have been made, and are now under consideration of Government.

Price-lists prepared under the Tenancy Act rules for the half-year ending December 1886 were submitted, and those for the half-year ending June 1887 also will soon be ready for publication.

Chapter VIII.—Trade and Trade Statistics.

58. Trade statistics are compiled in the Revenue and General Departments of the Bengal, Secretariat.

Chapter IX.—Miscellaneous.

Agricultural Exhibition.

59. In the Resolution on the first Annual Report of the Agricultural Department, it was remarked that Sir Rivers Thompson hoped to be able to attend

the Show which was to be held at Doomraon in February following, and to judge as to the utility of what, under the auspices of the Maharajah of Doomraon, promised to become an annual institution. Sir Rivers Thompson accordingly visited Doomraon in February and opened the Show held on that occasion, and I believe pronounced it to be a successful and useful institution.

The different sections in which exhibits were received, considering that the Show was merely one of a local character, were all well represented. The various implements invented in recent years with a view to meet the requirements of Indian agriculturists were exhibited, ploughing matches were held, and water-lifts and other machines were shown at actual work.

Some very fine specimens of wheat, barley, rice and millets were exhibited, for which, it may be mentioned, the first prizes were awarded to ryots of the Doomraon Raj, and of the Sasseram Government estates.

Ploughs and water-lifts were sold at the Show.

60. Though this Doomraon Exhibition promised to be a useful and permanent institution, yet as Mr. Allen, the Special Agricultural Officer of Patna, and Mr. Jenkins, the Sub-divisional Officer of Buxar, who, co-operating with Mr. Allen, had acquired much experience in the conduct of these Shows and in the supervision of the agricultural experiments hitherto made at Doomraon, have both of them been transferred, and as there is no officer now left in the Patna Division who can give close personal attention to these matters, or is possessed of the knowledge required for the intelligent and careful conduct of agricultural experiments, I doubt whether it will be possible to continue with advantage these experiments in the Doomraon farm, or whether the efforts hitherto made to excite interest in agricultural enquiry, and to introduce agricultural improvements in Shahabad, will be productive of the lasting beneficial results which I at one time anticipated from them. The experiments hitherto made at the Doomraon experimental station were designed, like Sir John Lawes' experiments in England, to afford data for arriving in the course of time—a long time it may be—at scientifically accurate conclusions on doubtful questions of Indian agriculture. The results of such experiments become misleading, and worse than useless, if the experiments are not made under the immediate supervision and control of skilled agency, and unless, before deducing conclusions from the reported results, all disturbing accidental elements of season and the like are carefully and intelligently observed and their effects eliminated. It is obvious that work of this kind cannot be done by ordinary officers of Government or agents of the Maharajah without special knowledge or training, and therefore, unless a special officer is made available for this purpose, or the Maharajah himself employs a Cirencester graduate at his own expense, I am unable to think that any permanently useful purpose will be served by carrying on agricultural experiments in Doomraon in the manner hitherto adopted. It may be supposed that there is no reason why the Maharajah should not work his home farm through his ordinary employés in accordance with the advice of officers of the Agricultural Department; but apart from the fact that, as I have frequently pointed out, there is very little in which the officers of the department are without further enquiry and experiment prepared to give dogmatic advice, it is further to be noted that mere advice on paper, without the agency and means for showing in actual practice the operation of the processes recommended, goes for little in most things, and for nothing in the introduction of novelties in Indian agriculture. This experimental station is, however, at present being worked under the immediate supervision of a subordinate Superintendent trained at Cawnpore, with such advice and assistance as can be given by Mr. A. C. Sen, who is stationed at Burdwan.

61. Local agricultural Shows were also held at Perozepore in Burrisaul, and Cox's Bazar in Chittagong, and at Mymensingh, under the direction of the local officers, but reports upon them have not yet been received.

Agricultural Implements.

62. *Ploughs.*—The question of supplying Bengal ryots with an efficient and cheap plough continues to receive attention. 4^6 Burrakar cast-iron ploughs, it is reported, have been sold during the year under review, but these ploughs

have not in general been very favourably reported upon. The cast-iron, it is said, soon wears away, and, moreover, has the drawback that, when once broken, it cannot, like wrought-iron, be repaired by native blacksmiths. The Shibpore wrought-iron inverting ploughs have been greatly improved, and those recently made work fairly well. It has not, however, been found possible to bring the price of this plough below Rs. 6, and its expensiveness is therefore a great impediment in the way of its general use by ryots. The fact that soil-inverting ploughs require strong bullocks to work them, and that they cannot be used at all in paddy cultivation, has led to attempts to improve the ordinary ryot's plough without converting it into a soil-inverting one. Colonel Neil, who has devoted much time and attention to the examination of agricultural implements, has invented a plough of this kind, which consists of a cast-iron share and a narrow mould board attached to a wooden upright. Mr. Son has also invented a plough of this description, which looks very much the same as ordinary ryot's plough, but has a good wrought-iron share, while the form of the breast of the plough is somewhat altered. Private firms in Calcutta have been invited to undertake the manufacture and sale of such of these ploughs as, after trial, can be recommended by Agricultural Officers, and Messrs. Main and Company of Calcutta have undertaken to do so, and are arranging with their Glasgow correspondents for the importation of them at the lowest price that may be possible.

63. *Water-lifts.*—A simple and cheap, but efficient, machine for raising water is a great desideratum in India, where, on account of very rapid evaporation of water and irregular distribution of rainfall, artificial irrigation must be so often resorted to.

As mentioned in my last report, a cast-iron chain-pump, after the model of the Cawnpore pump, is being manufactured and sold at the Burrakar Iron Works. A fair demand has sprung up for this lift, which was exhibited and much appreciated at Doomraon, but it cannot be said that we have yet got the machine which we really want. The Burrakar water-lift works well when the height to which the water is to be raised is from 6 feet to 12 feet; above 10 or 12 feet the power required to work the pump is very great, while below 5 or 6 feet the common *donga* used by native agriculturists is a more efficient arrangement. Even for heights between 6 and 12 feet the Burrakar chain-pump is not free from defects, for, while it is being worked, the chain sometimes becomes attached to the grooved wheel in such a way that the work must be stopped in order to detach it. This pump, however, requires repair much less frequently than that known as the Cawnpore pump, and is cheaper and more efficient.

Co-operation of bodies interested in agriculture and trade.

64. I am much indebted to the Chamber of Commerce for the cordial co-operation and the ready aid they have rendered in appraising the value of different samples of wheat; in furnishing valuable information and suggestions regarding various economic products, and also in preparation of forecasts. The Agri-Horticultural Society also gave some assistance in procuring samples of economic products. As mentioned in last year's report, a programme of agricultural experiments to be tried by members of the society was drawn up in communication with the Secretary of the Society, and it was hoped that some of the experiments therein suggested would be tried by selected members of the Society; that the results would be reported; and that, where they proved to be successful, efforts would be made by such members to introduce in their neighbourhoods the improvements suggested by these results. No experiments of the kind seem, however, to have been tried, or, if tried, the results have not been reported.

65. *Forecasts of crops.*—Forecasts of the wheat and jute crops were prepared during the year, which the Dundee and Calcutta Chamber of Commerce have declared to be useful to them.

66. *Miscellaneous questions connected with Agriculture, Settlements, and the Tenancy Act.*—A considerable portion of my own time has been devoted to the preparation of reports and furnishing advice on various questions connected with agriculture, settlements and surveys, and the working of the Tenancy Act.

67. *Tours.*—During the year I visited Patna, Bhagulpore, Burdwan more than once in connection with agricultural work;

Mozufferpore, Chittagong, Noakhally, and Dinagepore, and Angul where settlements were being carried on under my supervision;

Berhampore, on enquiries relating to silk, and Serajgunge, on enquiries connected with preparation of jute forecasts.

I also visited Raipore and the Central Provinces with Sir E. Buck.

68. *Merits of Officers.*—All the officers employed in the Department continued to give satisfaction.

I have the honour to be,

SIR,

Your most obedient servant,

M. FINUCANE,

Director of the Agricultural Department, Bengal.

C E G.—Reg. No. 9244J—100—14-9-87.

REVENUE DEPARTMENT.

BENGAL SECRETARIAT LIBRARY.

AGRICULTURE.

CALCUTTA, THE 19TH DECEMBER 1887.

RESOLUTION.

READ—

The Director's report of the Department of Land Records and Agriculture for the year 1886-87.

Survey and Settlement.

The Director was employed during the year on surveying, with a view to settlement, the Government estates of Nulcheera and Angul, the Wards' estates of Sunkerpore and Churamon, and in making a survey and record of rights in a tract, the property of private persons, in the district of Mozufferpore, the whole area dealt with amounting to 1,845 square miles. The latter operations were of the nature of an experiment, conducted at the public expense, with a view to ascertaining how far it might be practicable and desirable to carry out similar work on a large scale, and at the cost of the locality benefited. Although the whole of the area originally selected was not measured, the object with which the task was undertaken seems to have been obtained, inasmuch as it has been shewn, so far as a conclusion can be drawn in a matter of this kind from a single instance, that the difficulties in the way of such operations are not insuperable. It was moreover found that in the great majority of villages much uncertainty existed as to the amount of the existing rent, so that positive good was done by ascertaining and making an authentic record of what was before indeterminate. No formal applications were made for the enhancement of rent, which was, however, in some instances, raised by private agreement between the parties. On the whole, the experience gained is favourable to the prosecution of the work of survey and record, but it appears desirable, in view of the Secretary of State's decision conveyed in the Government of India's letter No. 603R—27-11, dated the 3rd September 1886, to confine this, for the present at least, to estates the property of Government, or on which those interested appreciate and offer to pay for the advantages of a settlement. Even within these limits it is anticipated that employment will be found during the next cold season for the whole of the trained agency which Government can command. The conduct of these settlements now constitutes the principal duty of the Director of the Department of Land Records and Agriculture, an appointment which has recently been made permanent with the sanction of the Secretary of State.

Analysis of districts.

2. Enquiries were made during the year by Mr. A. C. Sen and Mr. Sakhawat Hossein as to the agricultural practices of the districts of Dacca and Mymensingh. These investigations should be made, and their statistical results recorded in such a manner as to be of use in connection with the revision now being made of the Gazetteer of Bengal. Mr. Sen has made a very high estimate of the agricultural capabilities of the large tract of land which forms and surrounds the Madhupore jungle, and considers it particularly suitable for the cultivation of sugarcane, cotton, rhea, and mulberry; but for want of capital and enterprise its resources remain at present undeveloped.

Eradication of disease among silkworms.

3. Much anxiety has been felt by those interested in the silk industry in Bengal on account of the spread of diseases among worms, particularly of what is known to the rearers as *kata*, and is pronounced by Mr. Wood-Mason to be the same as the *pebrine*, which has in recent times broken out in an epidemic form in Europe. A French expert, Monsieur Clement, has recently been engaged for two years to investigate and deal with the subject upon the system introduced by Monsieur Pasteur. In the meanwhile, Mr. N. G. Mookerjee, a Cirencester scholar, has been engaged on the work; his labours are, as the Lieutenant-Governor ascertained when on tour, much appreciated by those best able to form a judgment, and seem to have met with some actual success. The Director states that—

The native rearers have shown a preference for the seed reared and microscopically examined by Mr. Mookerjee to that reared in the ordinary way, and went so far as to incur

the expense of buying, according to his advice, untainted mulberry leaf at a high price, rejecting leaf in their possession, which is believed to be tainted. by use on the land, on which it was grown, of manure containing excreta of diseased silkworms. Mr. Mookerjee now thinks that he has eradicated disease from his experimental Madrasi stock, and he is probably right; but it remains to be decided by the expert from Europe, who is soon expected, whether he has really done so. If it should prove that he has, then the question of the extension of the methods adopted by him will have to be carefully considered Enquiries are also being made on the subject of the natural history and ravages of the silkworm fly, of which little is at present known."

Agricultural experiments.

4. The cost to Government of the agricultural enquiries and experiments conducted during the year, including the distribution of implements and seeds, was Rs. 6,860. Some work of this nature was also done by private individuals, particularly by the Maharajah of Doomraon, at their own expense, but with the assistance of the Department. The results obtained were, in many instances, valuable rather for future comparison than for immediate application. It is stated that Mr. Sen sold during the year under report more than a hundred maunds of bone-meal to ryots of the villages in which he had distributed small quantities *gratis* during the previous year, and that the purchasers are keenly watching the effects of the manure. The introduction of the superior Buxar wheat into Bhagulpore was not so successful this year as last, but nevertheless it appears to be in that Division an improvement likely to have permanent results. Beyond Bhagulpore the seed has not hitherto done well. It is stated that 486 of the improved Burrakar ploughs were sold during the year, but that they have not in general been very favourably received, as they require strong bullocks to work them, and cannot be used for paddy cultivation. Further efforts are being made to supply a plough adapted to the peculiar conditions of agriculture in this country. As to improving the breed of cattle Mr. Finucane remarks:—

"Two Hissar bulls were supplied for use on the Government estates in Arrah and Sasseram, and two half-bred English bulls were presented to Government by Dr. Greenhill. Of these, one, out of a fine country cow by Zooloo, an imported Jersey bull, has been made over to the Manager of the Burdwan Raj, and the other, out of a fine Hansy cow by an imported Durham bull, was given to the Arrah Municipality, that body having undertaken to provide for the maintenance and custody of the animal, and to report through their Chairman whether any improvement in the local breed of cattle may be effected by means of it. These are but isolated and insignificant efforts, but to anybody who is acquainted with the improvement effected by Mr. Tayler, when Commissioner of Patna, in the breed of cattle in that locality by the introduction of one or two English bulls—an improvement which is visibly marked up to this day—it will be apparent that even isolated efforts of this kind may effect some good, and if other municipalities and public bodies would follow the example set by the Arrah Municipality, and would interest themselves in seizing and weeding out such of those wretched country bulls as are diseased, and now roam about spreading disease wherever they go, and if they would keep for public use, in local pounds or elsewhere, a suitable and superior class of sires, which might be procured for them at their expense by Government, much might be effected towards improving the breed of cattle in these Provinces, without entailing any expenditure on the State."

This is a subject to which the attention of Agricultural officers is invited with a view to further suggestions, for the guidance of zemindars and others who take an interest in improving the breed of cattle. It is understood that sires are now generally provided by individuals who do not seek any profit for themselves, but to benefit the public, and to observe a custom to some extent connected with religion. Persons acting from such motives would probably be in many instances amenable to well-considered advice. The Director expresses himself much indebted to the Chamber of Commerce for the cordial co-operation and the ready aid they have rendered in appraising the value of different samples of wheat; in furnishing valuable information and suggestions regarding various economic products, and also in preparation of forecasts. The Agri-Horticultural Society also gave some assistance in procuring samples of economic products.

5. The thanks of the Lieutenant-Governor are given to Mr. Finucane for his efficient performance of his duties during the year. He states that all the officers employed in the Department continued to give satisfaction.

By order of the Lieutenant-Governor of Bengal,

P. NOLAN,
Secretary to the Govt. of Bengal.

No. 3898—676Agri.

COPY with copy of the Report, forwarded to the Secretary to the Board of Revenue, Land Revenue Department, for the information of the Board.

No. 3899—677Agri.

COPY forwarded to the Director of the Department of Land Records and Agriculture for information.

Circular No. 37Agri.

COPY, with copy of the Report, forwarded to all Commissioners of Divisions and District Officers (through Commissioners) in Bengal for information

By order of the Lieutenant-Governor of Bengal,

W. C. MACPHERSON,

Under-Secretary to the Govt. of Bengal.

CALCUTTA,
The 28th December 1887.

C. E. C.—Reg. No. 131660—6 4—3-1-88